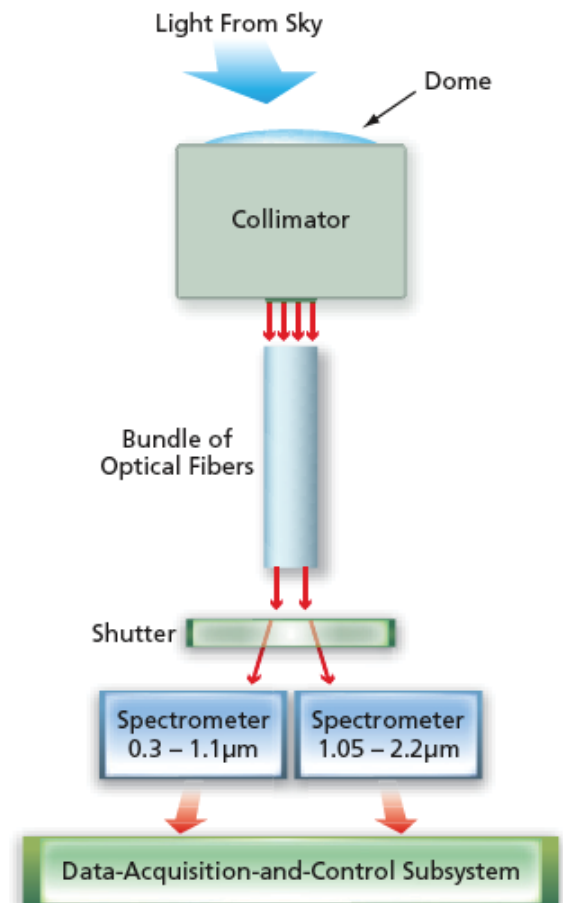


**technology opportunity**

Light Collimator and Monitor for a Spectroradiometer

This System Handles the Optical Input and Electronic Output of Two Spectrometers

A system that comprises optical and electronic subsystems has been developed as an infrastructure for a spectroradiometer that measures time-dependent spectral radiance of the daylight sky, in a narrow field of view (having angular width of the order of 1°) centered on the zenith, in several spectral bands in the wavelength range from 0.3 to 2.2 μm . This system is used in conjunction with two commercially available monolithic spectrometers: a silicon-based one for wavelengths from 0.3 to 1.1 μm and a gallium arsenide-based one for wavelengths from 1.05 to 2.2 μm (see figure). The role of this system is to collect the light from the affected region of the sky, collimate the light, deliver the collimated light to the monolithic spectrometers, and process the electronic outputs of the spectrometers. This system includes a dome that faces the sky. Light collected via the dome passes through a collimator that has an aperture diameter ≈ 22 mm, a focal length ≈ 50 mm, and a field-of-view angular width that is adjustable between 1° and 2° . The collimated light enters a bundle of optical fibers that are chosen to have small numerical apertures so as to further limit the acceptance angle of received light. After propagating along the bundle of optical fibers, the light encounters a shutter that is operated on a controlled cycle, during which the shutter is alternately open for a time t_1 , then closed for a time t_2 . The cycle frequency can be 5 Hz or any suitable lower frequency; in practice, the cycle frequency (and, hence, the associated sampling frequency) is typically chosen to be 1 Hz.



The Spectroradiometer comprises optical and electronic subsystems that include two spectrometers operating in conjunction with the system described in the text.

Technology in Detail

When the shutter is open, light enters the monolithic spectrometer, electronic circuits in the spectrometers preprocess the outputs of photodetectors (one photodetector for each wavelength band), and the outputs of the spectrometer electronic circuits for the various wavelength ranges are sent to a data-acquisition-and-control subsystem that is part of the present system. When the shutter is closed, the same process takes place, for the purpose of collecting dark-current readings from the photodetector of each wavelength band.

The data-acquisition-and-control subsystem digitizes the spectrometer outputs and further processes them to generate any or all of a variety of useful output data. Among other things, this subsystem subtracts shutter-closed (dark-current) readings from shutter-open readings to obtain corrected spectral-radiance readings. In addition to alternately opening and closing the shutter and taking dark-current readings during the t_2 portions of successive cycles, the system can be made to sample dark currents during longer periods (e.g., a dark period of 5 minutes during each hour) to enable identification of anomalies in this system and/or in the spectrometers.

Patents

This technology has been patented (U.S. Patent 7,869,029).

Licensing and Partnering Opportunities

This technology is part of NASA's Innovative Partnerships Office, which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to inquire about licensing possibilities for this technology for commercial applications.

For More Information

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